



Callaway Plant

January 21, 2016

ULNRC-06269

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

10 CFR 50.73

Ladies and Gentlemen:

**DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
RENEWED FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2015-003-01
REACTOR TRIP CAUSED BY TRANSMISSION LINE FAULT**

On October 1, 2015, Callaway Plant submitted Licensee Event Report (LER) 2015-003-00 in accordance with 10 CFR 50.73(a)(2)(iv)(A) to report a reactor protection system actuation while critical and an auxiliary feedwater system actuation, both due to a plant trip caused by a transmission line fault.

The enclosed LER supplement, LER 2015-003-01, is submitted to update the cause for the same condition, and to incorporate editorial corrections.

This letter does not contain new commitments.

Sincerely,

Barry Cox
Senior Director, Nuclear Operations

DRB/tlw

Enclosure

cc: Mr. Marc L. Dapas
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Index and send hardcopy to QA File A160.0761

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**LICENSEE EVENT REPORT (LER)**
(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollections@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Callaway Plant Unit 1	2. DOCKET NUMBER 05000483	3. PAGE 1 of 4
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4. TITLE
Reactor Trip Caused by Transmission Line Fault

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	11	2015	2015	- 003 -	01	01	21	2016	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)			
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
10. POWER LEVEL 100	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in the Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT T.B. Elwood, Supervising Engineer, Regulatory Affairs and Licensing	TELEPHONE NUMBER (Include Area Code) 314-225-1905
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
C	EL	XFMR	Mitsubishi Electric	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On August 11, 2015, at 01:39 Callaway plant tripped from 100% power due to an incorrect, automatic response to a transmission line fault on the Montgomery-Callaway 8 line by transformer bus differential relaying. This resulted in Reactor Protection System (RPS) and Auxiliary Feedwater System actuations. The plant response to the trip was as expected except for a problem encountered with Auxiliary Feedwater flow control valve ALHV0007 subsequent to the plant trip.

This event was caused by the inadvertent inclusion of jumpers in the current transformer (CT) circuits of the main transformers that were installed as part of Main Transformer Replacement Modification 09-0044 implemented in Refuel 19. Following the event, the inadvertently placed CT jumpers were removed and the plant was successfully restarted.

The root cause of the incorrect main transformer CT wiring was that a drawing originally depicting the wiring configuration was not revised properly when it was converted from a generic Standardized Nuclear Unit Power Plant System (SNUPPS) drawing (E-03MA02) to a Callaway-specific drawing (E-23MA02) in the 1983 timeframe. This eventually resulted in design and testing errors during modification development.

Corrective actions include additional design, testing and job reviews, as well as reviews of similar drawings to identify and correct missing information.

NRC FORM 366a
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018


**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollections.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Callaway Plant Unit 1	05000- 483	2015	003	01

NARRATIVE**1. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):**

The main step-up transformers [EIIIS system EL] take the generator output (25,000 VAC) and transform it to switchyard voltage (345,000 VAC). The main step-up transformers are located outside of the turbine building, across from the switchyard. The power from the main step-up transformers is transmitted to the offsite transmission network (grid) via the switchyard.

The main step-up transformers consist of three single-phase transformers. Each transformer is oil-filled and rated at 533.3 MVA. The low-voltage winding is connected in a delta configuration. The high-voltage winding is connected in a wye configuration with a solidly grounded neutral.

The main transformers were replaced during Refuel 19 (Spring 2013) by modification MP 09-0044.

2. INITIAL PLANT CONDITIONS:

Prior to the event, the plant was in Mode 1, at 100% power. There were no activities going on at that time that could have caused this event. There was no equipment out of service that would have had an impact on this event.

3. EVENT DESCRIPTION:

On August 11, 2015, at 01:39 an unexpected turbine trip occurred, followed immediately by a reactor trip. The first-out alarm was 113F, "Unit Trip Turb Trip." Following the trip, enabling of the P-4 interlock coincident with a low T-Avg (564 F) condition caused a Feedwater Isolation Signal to be generated. Subsequently, Motor Driven Auxiliary Feed Pump (MDAFP) actuation, Turbine Driven Auxiliary Feed Pump (TDAFP) actuation, and Steam Generator (SG) Blowdown Isolation signals were initiated.

Prior to the event, the Callaway plant was stable in Mode 1 at 100% power (3562 MWth, 1248 MWe).

On August 11, 2015, at 01:39 switchyard relays operated during a momentary fault on the MTGY-CAL 8 transmission line approximately 2 miles from the Callaway Plant. The transmission line breakers opened and reclosed automatically as designed. However, the operation of relays in the Callaway switchyard tripped the switchyard generator breakers open, which resulted in a turbine trip followed by a reactor trip.

Immediately after the trip, the transmission dispatcher called and reported that there was a phase-3 fault on the MTGY-CAL 8 line approximately 2 miles outside of Callaway, and that the transmission line breakers had reclosed.

The Callaway operating crew implemented the trip response procedures (E-0, "Reactor Trip or Safety Injection," and ES-0.1, "Reactor Trip Response,") to verify the plant's response to the reactor trip signal from 100% power and to stabilize the unit in mode 3.

The plant response was uncomplicated, as systems responded as expected. This included satisfactory operation of the Turbine Driven Auxiliary Feedwater Pump (TDAFP), which provided flow to all four steam generators. For the "B" Motor Driven Auxiliary Feedwater Pump (MDAFP), discharge flow control valve ALHV0007 (MDAFP B to S/G A HV) initially responded as required (i.e., closed on demand). However, in response to a subsequent demand to open the valve, the valve remained closed and could not be manipulated from the control room using ALHK0007A

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Callaway Plant Unit 1	05000-	483	2015	003	01

NARRATIVE

(SG A MD AFP AFW CTRL). ALHV0007 was declared inoperable, and Condition C of Technical Specification (TS) 3.7.5, "Auxiliary Feedwater (AFW) System", was entered for the inoperable 'B' MDAFP train. An Operating Technician (OT) was dispatched to the valve, and the valve was manipulated locally by turning its handwheel. The valve was repaired prior to the end of the TS 72-hour Completion Time for Required Action C.1. Inoperability of this valve did not prevent the delivery of adequate auxiliary feedwater flow to the steam generators from the TDAFP.

Event investigation revealed that jumpers were inadvertently included in the main transformer CT circuits, causing switchyard generator position differential relays to incorrectly operate, which in turn caused lockout relays to trip output breakers in the switchyard, thus causing the turbine and reactor trips. A field change notice (FCN) was generated to remove the incorrect jumpers from the main transformer CT circuits prior to plant startup.

The problem encountered with ALHV0007 was reflective of a condition determined to exist for both the ALHV0007 valve and the ALHV0005 valve (MDAFP B to S/G D HV). No problem with valve movement for ALHV0005 occurred at the time the ALHV0007 problem was revealed; however, this condition has been separately evaluated for reportability and has been addressed in Licensee Event Report (LER) 2015-04-00.

4. ASSESSMENT OF SAFETY CONSEQUENCES:

Except as noted for the ALHV0007 valve, safety systems responded as required during this event. The reactor protection system functioned as necessary to shut the reactor down and maintain it in a safe condition. All safety functions, including reactor core decay heat removal, were satisfied.

This event was evaluated with the Callaway PRA model. The evaluation determined the incremental conditional core damage probability (ICCDP) of this event was less than $1E-6$; therefore, this event was of very low risk significance.

5. REPORTING REQUIREMENTS:

This LER is submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) to report a reactor protection system actuation while critical and an auxiliary feedwater system actuation.

Specifically, 10 CFR 50.73(a)(2)(iv) states in part, "The licensee shall report:

(A) Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section ...

(B) The systems to which the requirements of paragraph (a)(2)(iv)(A) of this section apply are:

(1) Reactor protection system (RPS) including: reactor scram or reactor trip

(6) PWR auxiliary or emergency feed water system."

The RPS was actuated on August 11, 2015, at 01:39, during normal power operations (from 100% power). This fulfills the reporting requirement of 10 CFR 50.73(a)(2)(iv)(A) by actuation of the system specified in

NRC FORM 366a
(11-2015)

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Callaway Plant Unit 1	05000-	483	2015	003	01

NARRATIVE

10 CFR 50.73(a)(2)(iv)(B)(I).

A valid auxiliary feedwater system actuation was received as a direct consequence of the turbine and reactor trip. This also fulfills the reporting requirement of 10 CFR 50.73(a)(2)(iv)(A) by actuation of the system specified in 10 CFR 50.73(a)(2)(iv)(B)(6).

6. CAUSE OF THE EVENT:

This event was caused by inadvertently installed main transformer CT jumpers that were installed as part of Main Transformer Replacement Modification 09-0044 implemented in Refuel 19 (Spring 2013). Following the event, the CT jumpers were removed consistent with the intended configuration, and the plant was successfully restarted after making the corrections.

The root cause of the incorrect main transformer CT wiring was that a drawing originally depicting the wiring configuration was not revised properly when it was converted from a generic Standardized Nuclear Unit Power Plant System (SNUPPS) drawing (E-03MA02) to a Callaway-specific drawing (E-23MA02) in the 1983 timeframe. This eventually resulted in design and testing errors during modification development.

Specifically, original drawing E-03MA02 was marked up during plant startup testing. The jumpers on both main transformer CTs were crossed out on the markup to indicate that the jumpers were not installed. However, these drawing changes were never made. When the drawing was converted from E-03MA02 to E-23MA02, the unused jumpers were not removed from the drawing.

7. CORRECTIVE ACTIONS:

The corrective actions to prevent recurrence were to incorporate a design and a testing review by System Protection personnel to ensure the design is correct and testing is adequate for future relay designs. Construction Supervisors are being required to review jobs related to at-risk modification FCNs to ensure changes are made if they are impacted. Finally, from an extent-of-condition review, design drawings that have similar error traps such as incorrect and missing information will be identified and corrected.

8. PREVIOUS SIMILAR EVENTS:

No previous plant trips have occurred at Callaway due to incorrect response to a transmission line fault by transformer bus differential relaying. However, in 2010, a jumper shown on a design drawing was found to not be installed, and in 2012, a jumper was found left in a circuit that was not shown on drawings. These previous events are included as internal Operating Experience in the Root Cause Analysis for the current event.

Corrective actions for these events included additional programmatic guidance, training, and coaching of responsible personnel.